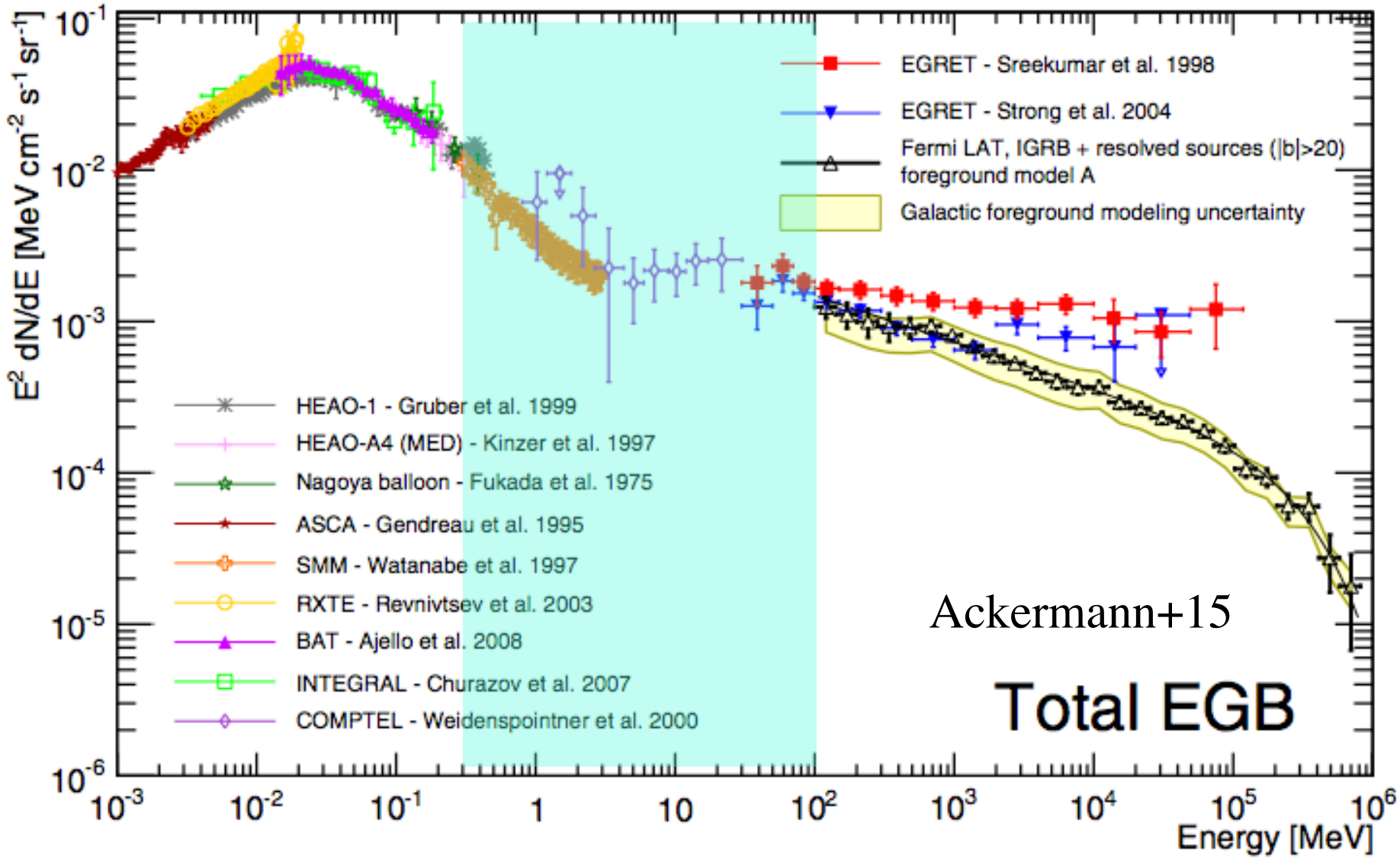
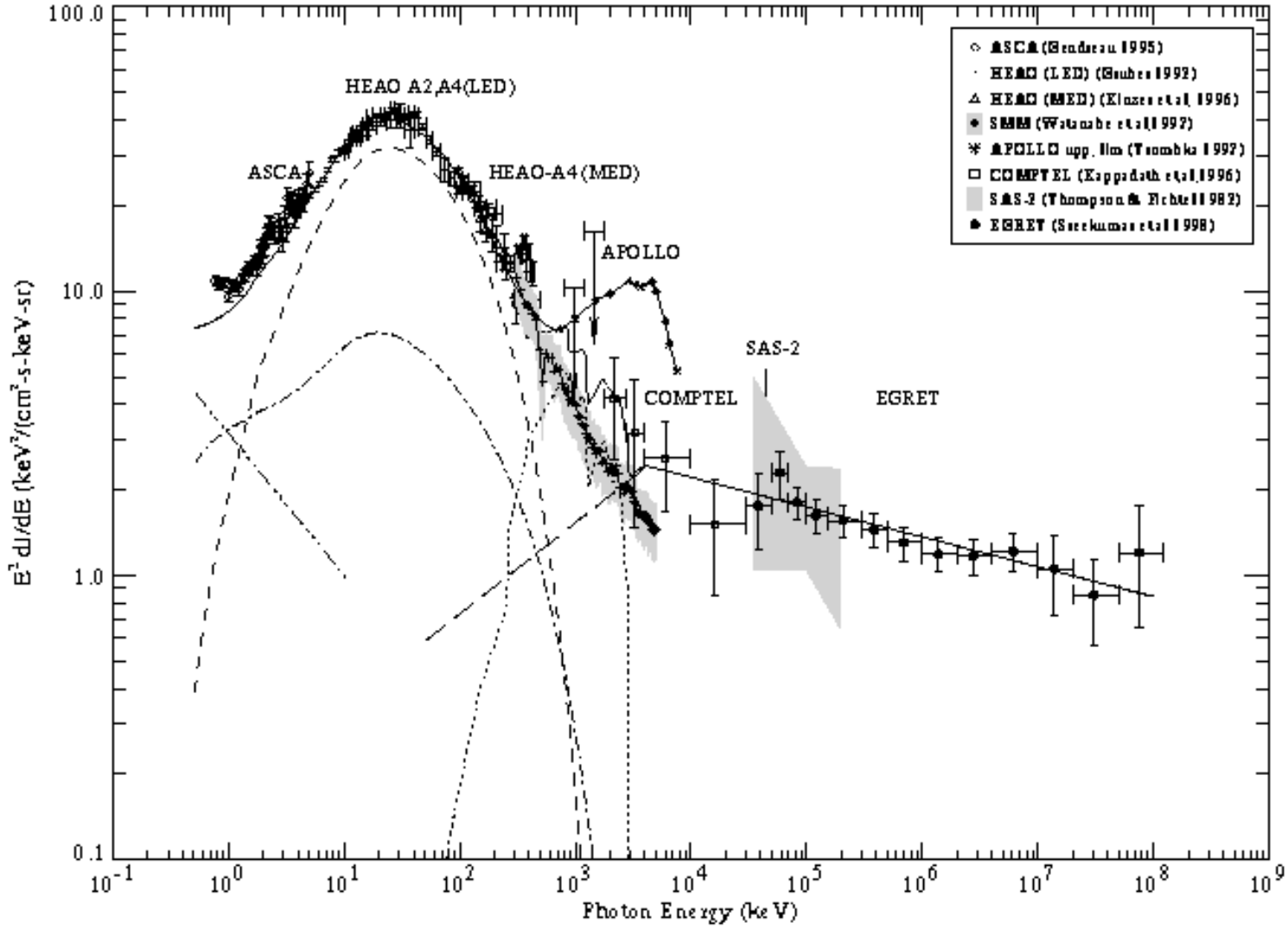
MeV Background

Open Issues and Future Prospects

The MeV Background



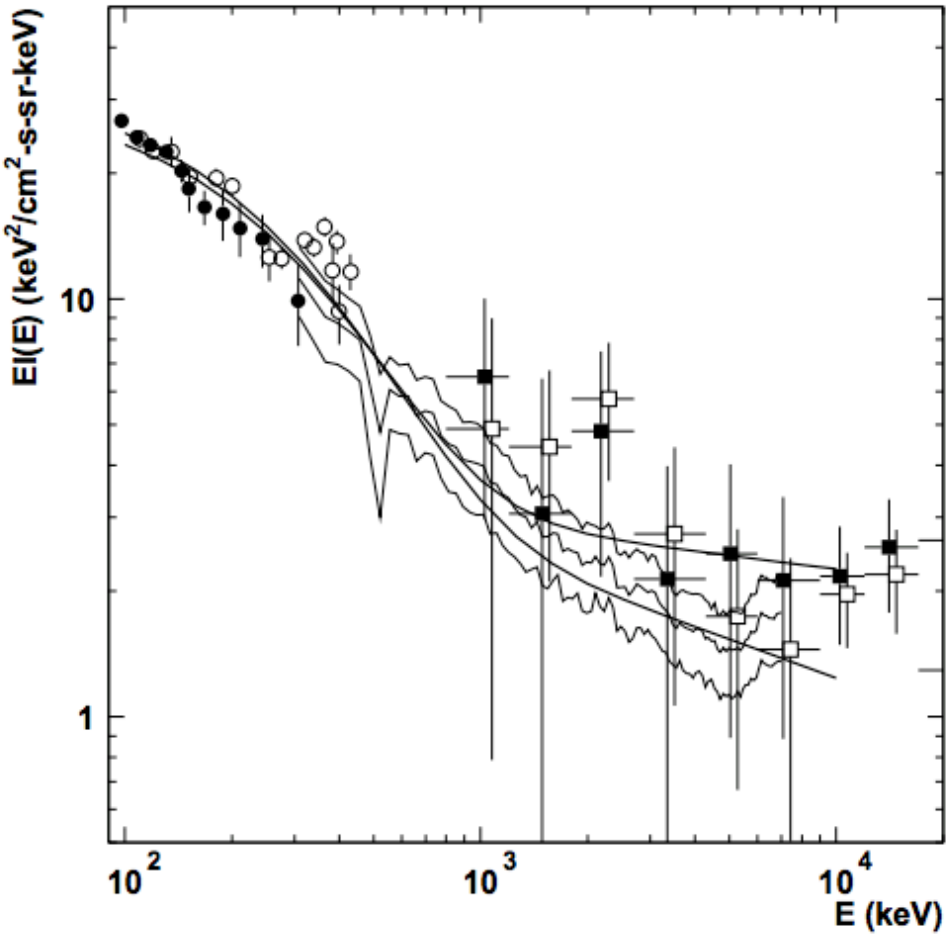
Some History



Trombka+, Kappadath+, Weidenspointner+

Latest COMPTEL Measurement

- Weidenspointer+99 rules out the presence of an MeV Bump



Origin of the MeV Background

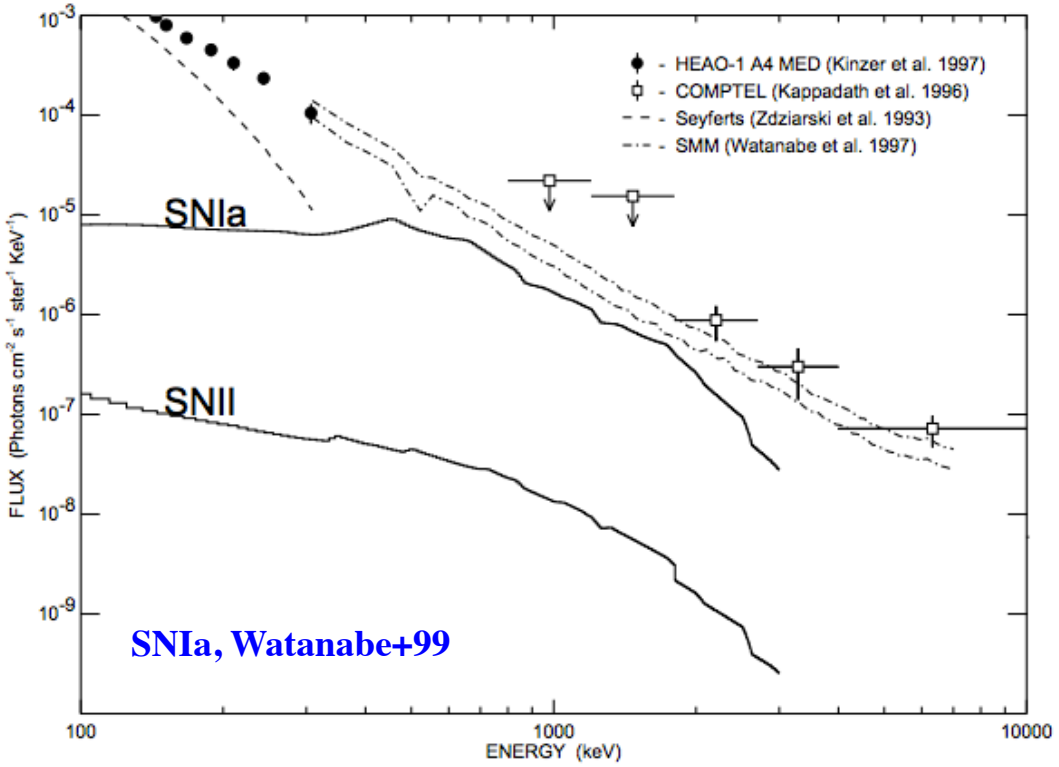
- Nuclear decays from SNe Ia (Clayton & Silk 1969, Zdziarski+96, Watanabe+99…Horiuchi&Beacom+10)

- AGN:
  - Non-thermal emission from radio-quiet AGN (Stecker, Inoue etc)
  - Non-thermal emission from blazars (Giommi, Ajello,etc)
  - IC/CMB scattering in radio lobes (Massaro & Ajello)

- Star forming Galaxies
  - Lacki+

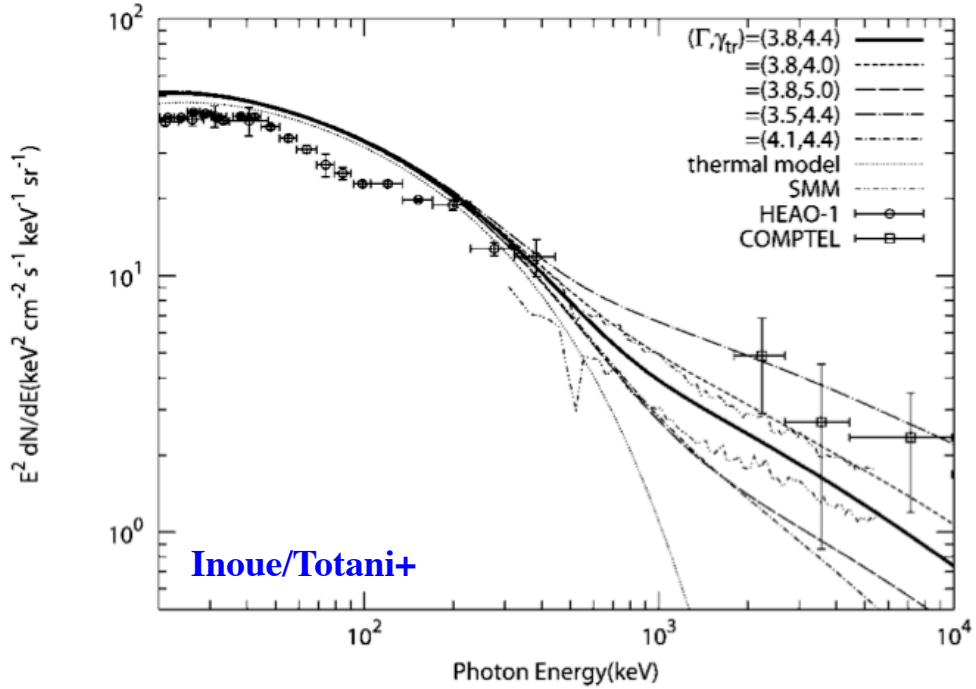
SN Ia

- SN Ia have strong gamma-ray emission due to radioactive decays and might contribute in a sizable way to the MeV background
- Largest uncertainty is the SN rates, particularly at high redshifts
- Newest measurements agree SNe Ia do not make the entire background although they certainly make some (~10%) !



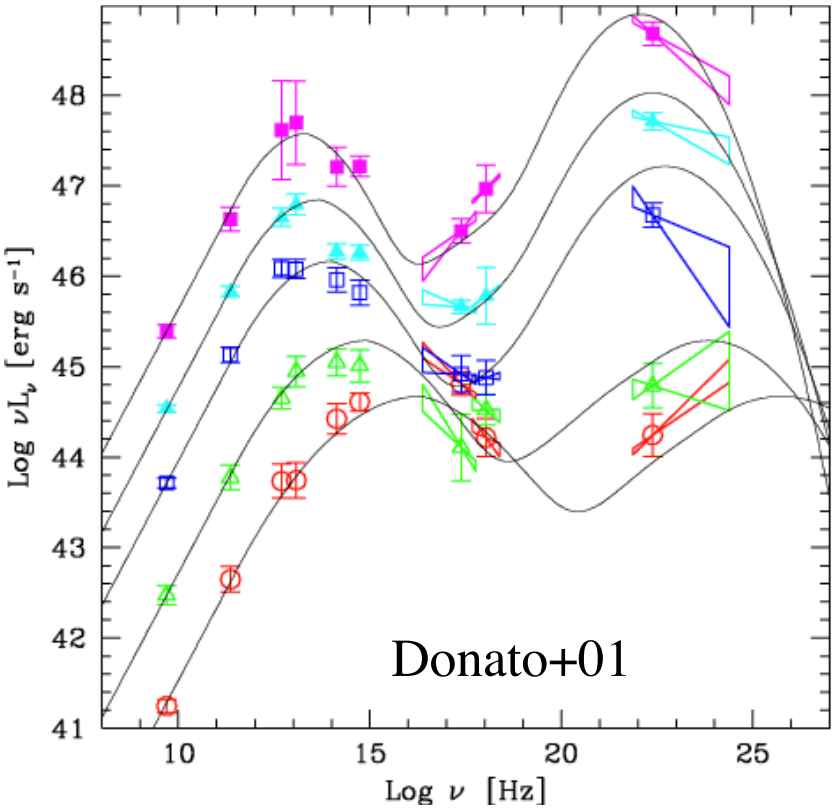
Radio-quiet AGN

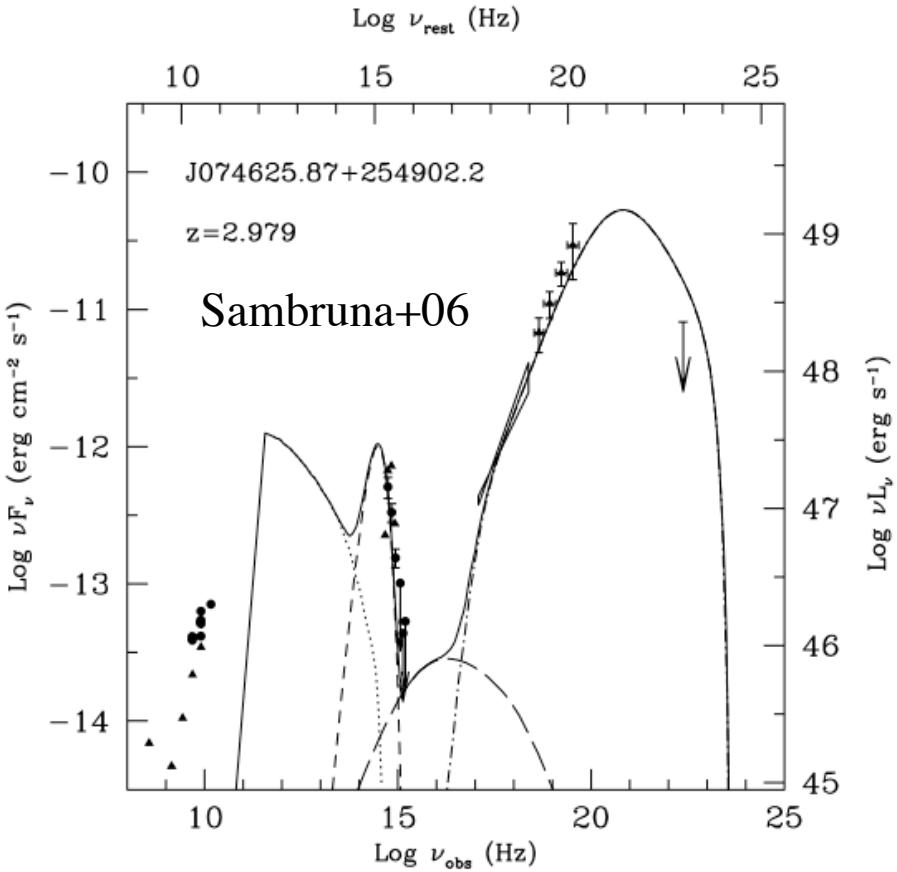
- X-ray spectra of AGN are due to Comptonization of UV photons by hot electrons in the corona (Stecker+99, Inoue+07)
  - AGN display a cut-off at ~300 keV due to the energy distribution of the electrons. The cut-off has been detected for a few objects (Zdiarzski+95)
- If the corona contains a small fraction of non-thermal electrons with a soft power-law distribution, then AGN with non-thermal tails could explain the background



Blazars

- MeV Blazars (Bloom+, Sambruna+, Sikora+) are among the most luminous persistent sources
- They are favorably detected in the X-ray band
- They will contribute some fraction of the MeV background





Blazars

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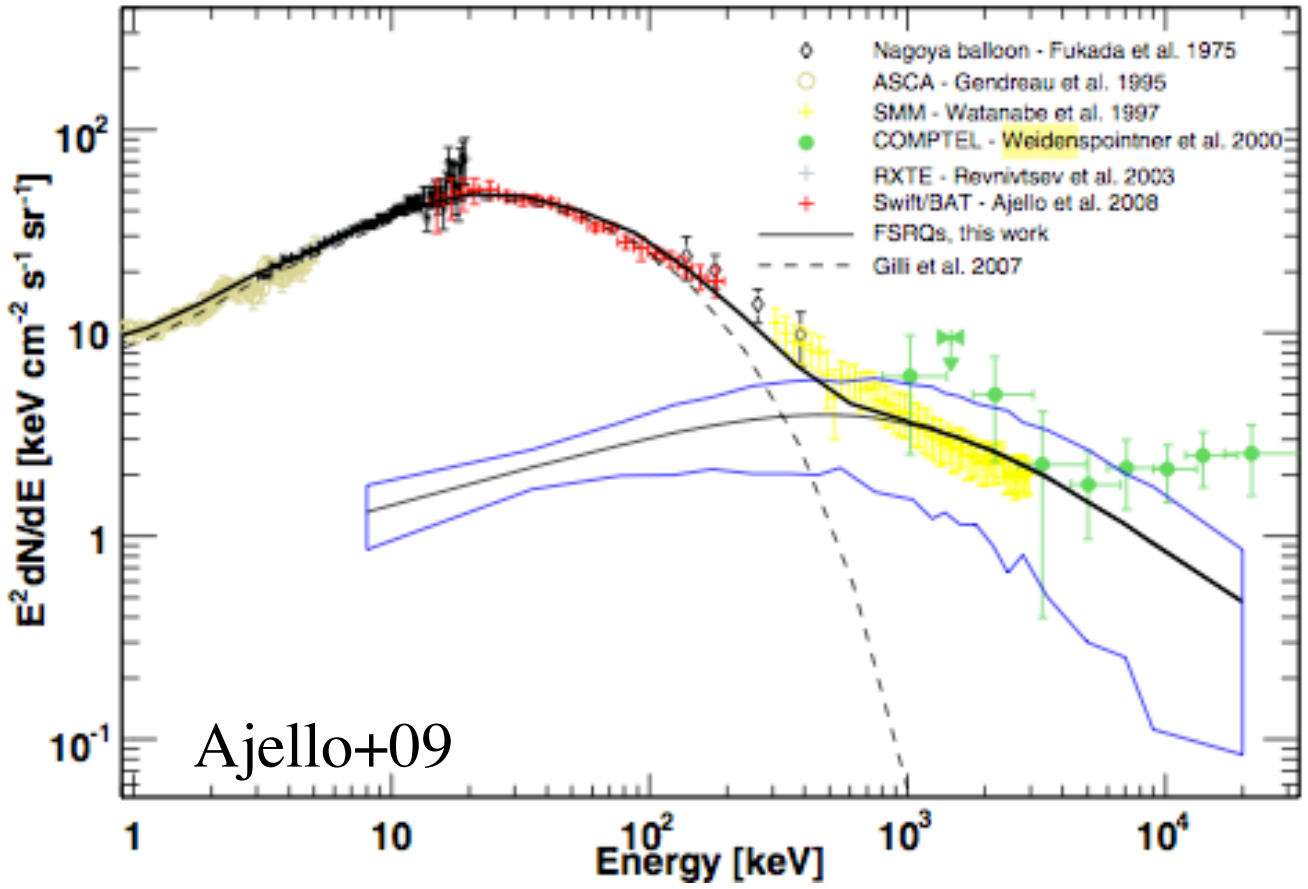
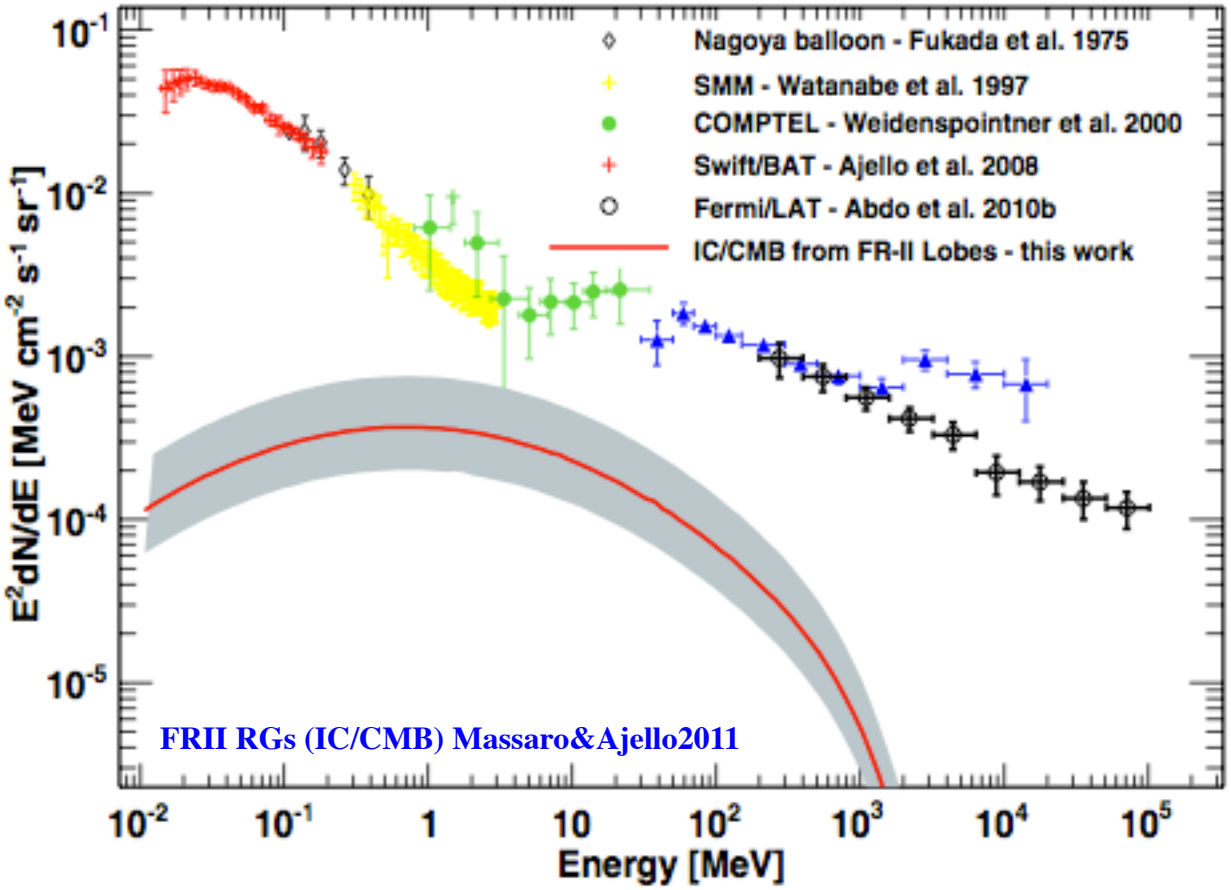


Radio Lobes

- Radio lobes are filled with energetic electrons that can upscatter the CMB



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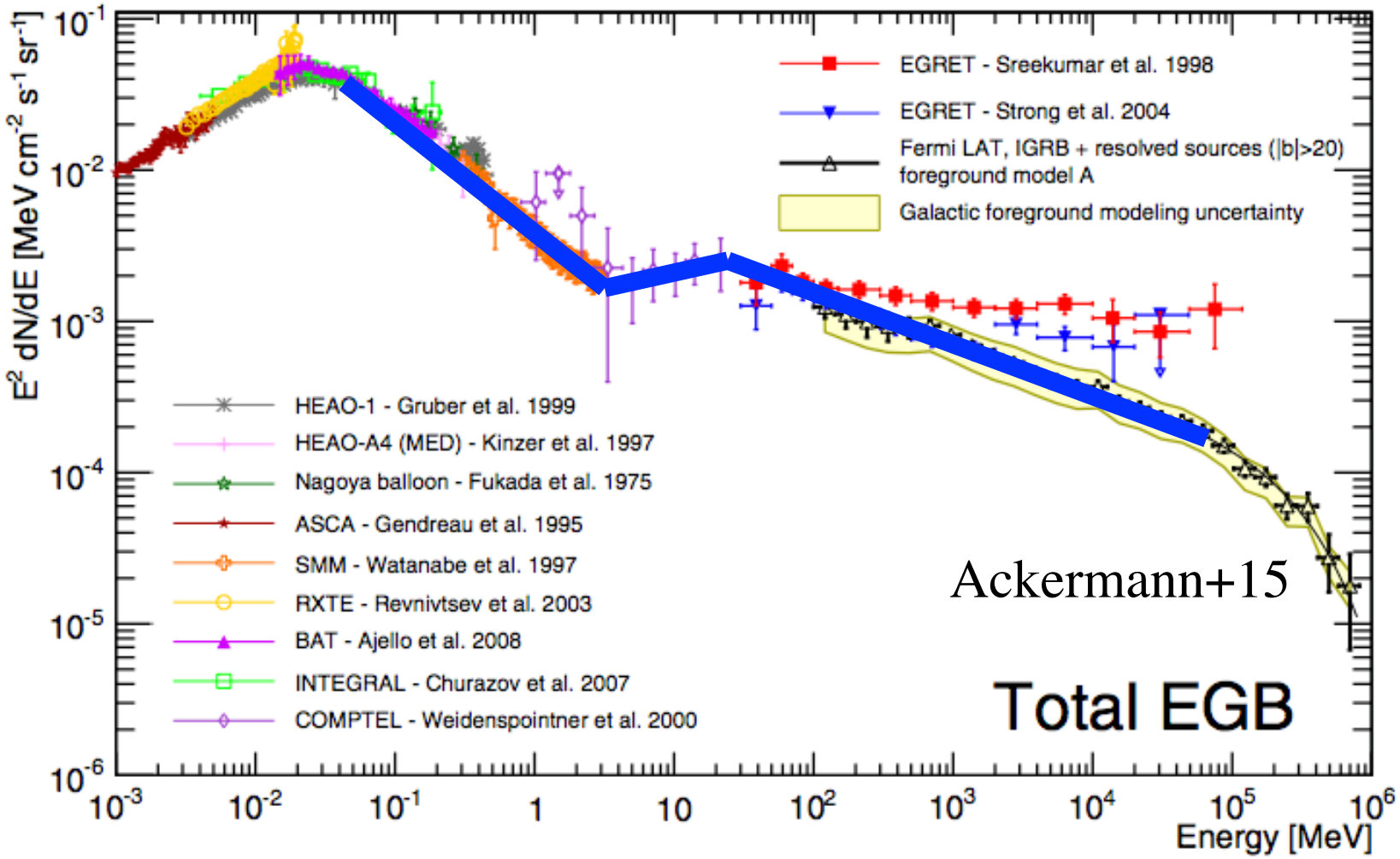
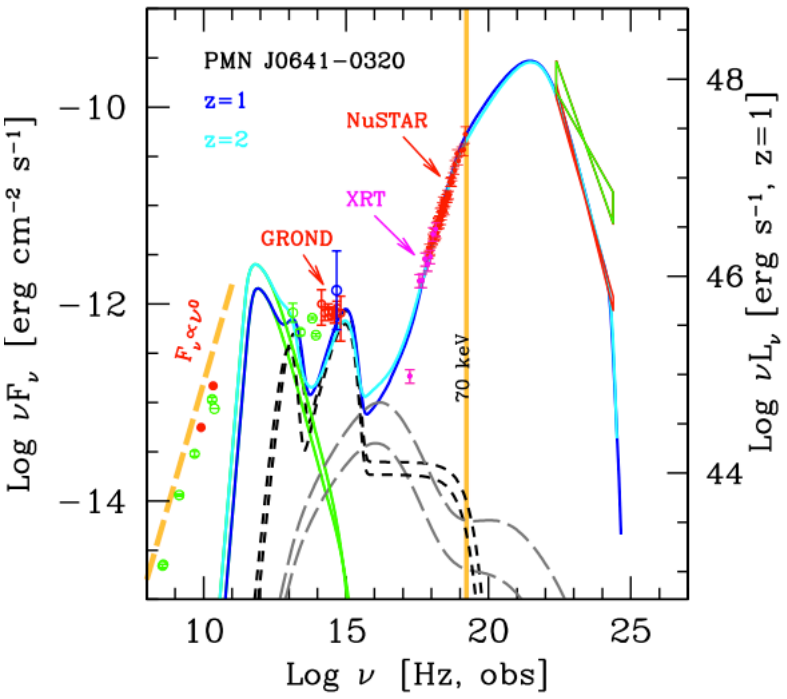
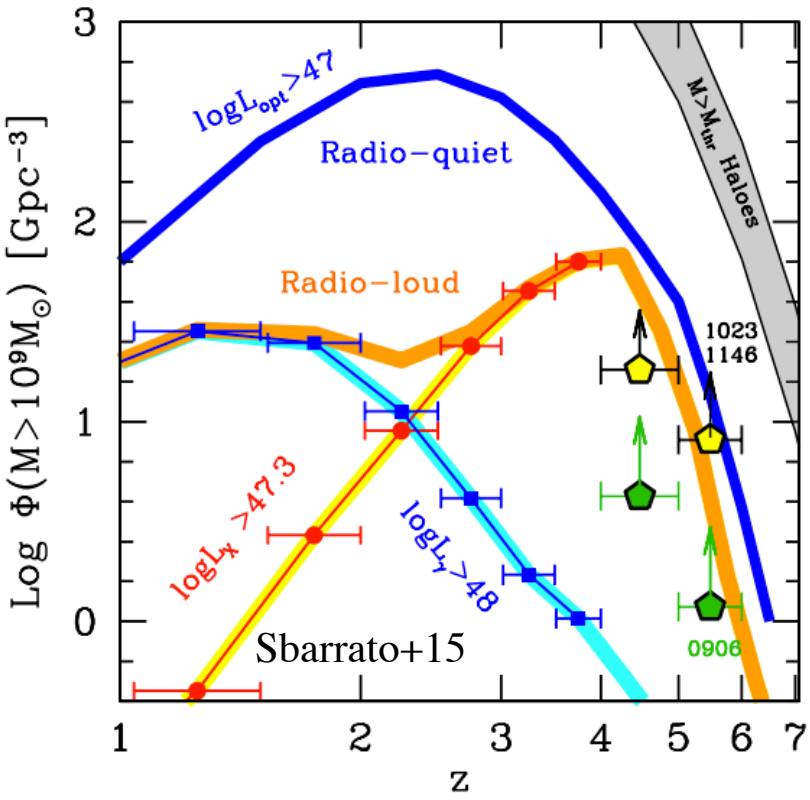


A New Mission

- A new mission sensitive in the <100 MeV would:
  - Assess whether AGN have non-thermal tails
  - Measure the number density of MeV blazars
  - Allow to understand which source population contributes how much
  - 50% Fermi-LAT sources have soft spectra->peak in the MeV band (D. Thompson)





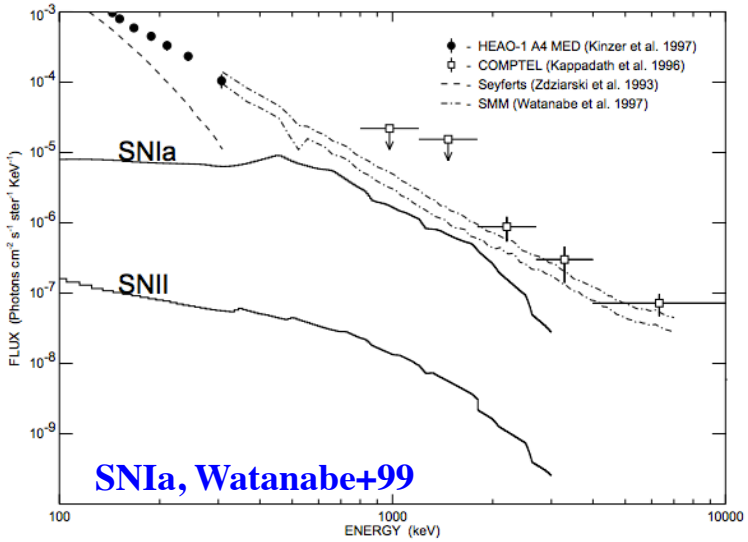
Conclusions

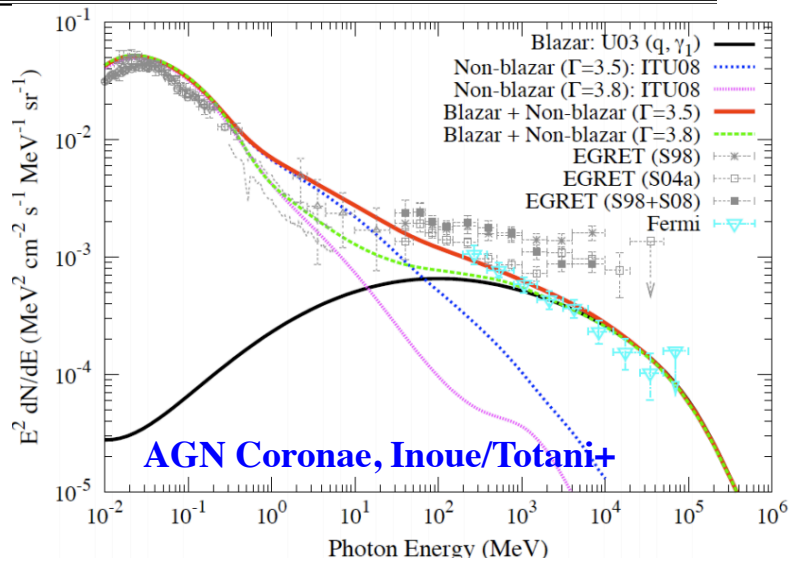
- The MeV background has an interesting shape
  - Must be hard below 10 MeV and softer above it to connect the X-ray and GeV backgrounds
  - If real, this means there is a peak and might point to a source population of mechanism producing that ‘feature’

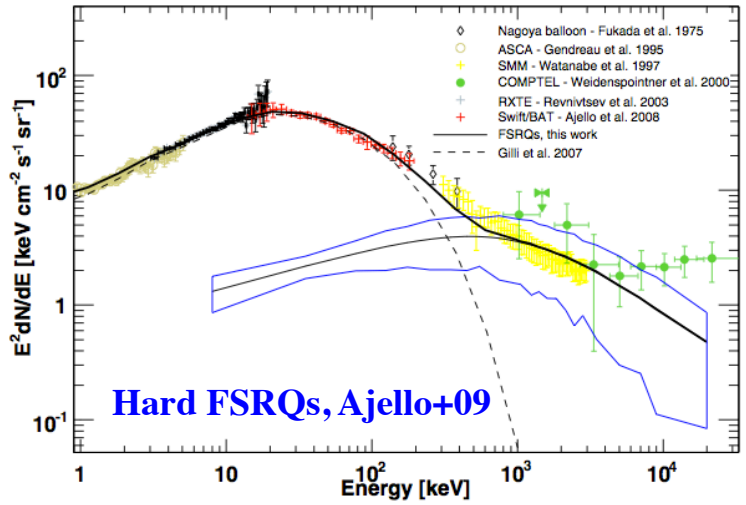
- The MeV background is likely produced by different source classes:
  - SN Ia
  - AGN
  - Star forming galaxies

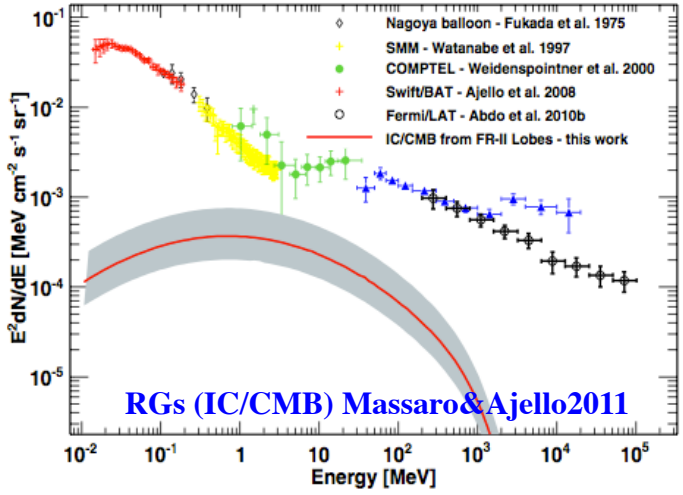
- Interesting Fact (brought up by Dave Thompson):
  - 50 % of all Fermi Sources have their SED peak at E<100MeV

Many Hypotheses … few answers









We will never understand the MeV background unless we go out there and measure it !

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